

OFFICE OF CIVIL ENGINEERING
UNITED STATES COAST GUARD
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SPECIFICATION FOR
12VDC, SIX-PLACE LAMPCHANGER
FOR MARITIME AIDS TO NAVIGATION,
TYPE CG-6P

SPECIFICATION NO. G-SEC-195H

1. SCOPE.

1.1 General. This specification establishes the performance and test requirements for 12VDC, spring-wound, six-place lampchangers (type CG-6P). The lampchangers are used to rotate a 12VDC, marine signal lamp of up to 40 watts into the focal position of a U. S. Coast Guard aids to navigation beacon.

1.1.1 Additional Information. The lampchangers are normally intended to hold and rotate lamps powered by: (1) 10 to 16 volt, air-depolarized primary batteries; (2) secondary lead-acid batteries; or, (3) transformer-rectified DC power supplies. Under normal operational use, the lampchangers will be contained in beacon assemblies on buoys or fixed structures in or around the navigable waters of the United States. These buoys and structures are exposed to all the elements of weather, including but not limited to rain, snow, shock, vibration, salt-spray, heavy winds, and on occasion a total immersion in water. The lampchangers will be exposed to extreme hot and cold temperatures while operating 12VDC marine signal lamps of up to 40 watts. Therefore, the lampchangers must be constructed from durable materials capable of withstanding all these extreme environmental conditions.

1.2 Precedence. Any ambiguity or conflict between this specification, drawings, and / or applicable documents shall be resolved by using the following documents in the precedence shown:

- a. The wording of this specification.
- b. Drawings contained in or attached to this specification.
- c. Applicable documents.

1.3 Government Furnished Equipment (GFE). The following equipment will be loaned to the contractor for use in first article testing:

- (4) Focus Fixtures
- (4) CG-181 Flashers
- (4) WK-681 Wiring Kits
- (10) 12 volt, 0.25 Amp Marine Signal Lamps
- (10) 12 volt, 3.05 Amp Marine Signal Lamps

2. APPLICABLE DOCUMENTS.

2.1 Government Documents. The following documents of the issues specified form a part of this specification to the extent referenced herein. Suffixes denoting the specific issue of each document will be omitted from future references to the document in this specification.

2.1.1 Military Specifications.

- | | | |
|----|----------------------------|---|
| a. | MIL-P-15024-E
29 Jan 93 | Plates, Tags, and Bands for Identification of Equipment |
| b. | MIL-G-45204-C
12 Mar 84 | Gold Plating, Electroplating |

2.1.2 U. S. Coast Guard Specifications.

- | | | |
|----|-----------------------|--|
| a. | G-ECV-181-I
Jan 94 | Specification for 12VDC Solid State Flashers
for Maritime Aids to Navigation (type CG-181) |
| b. | G-ECV-487
Jun 95 | Specification for 12VDC Marine Signal Lamps |
| c. | G-SEC-493-A
Jun 00 | Specification for 12VDC Solid State Programmable
Flashers for Maritime Aids to Navigation (type CG-493) |

2.1.3 Military Standards.

- | | | |
|----|--|---|
| a. | MIL-STD-202-F(12)
12 Jul 93 | Test Methods for Electronic and Electrical Component
Parts |
| b. | MIL-HDBK-454
Guideline 9
28 Apr 95 | General Guidelines for Electronic Equipment
(Workmanship) |

2.2 Drawings. The latest revisions of the following U.S. Coast Guard drawing form a part of this specification to the extent referenced herein.

- | | | |
|----|------------------------------|--------------------------------|
| a. | G-EOE-SK-1401-C
25 Oct 85 | Marine Signal Lamp (12 Volt) |
| b. | G-EOE-120050-D
31 Oct 85 | 12-Volt, Six-Place Lampchanger |

2.3 Other Publications. The following documents of the issues specified form a part of this specification to the extent referenced herein. Suffixes denoting the specific issue of each document will be omitted from future references to the document in this specification.

- a. ASTM G82-83 Standard Guide for Development and Use of a Galvanic
28 Nov 83 Series for Predicting Galvanic Corrosion Performance.
- b. ANSI / ASQC C1-1985 American National Standard; Specification of General
Nov 85 Requirements for a Quality Program.

3. REQUIREMENTS.

3.1 Design and Construction. The lampchanger shall hold six 12VDC, 0.25 to 3.05 ampere, single contact, candelabra base lamps with a prefocus collar (marine signal lamps) in a turret. Only the lamp in the operating (uppermost) position shall burn when voltage is applied between the "L" and "(-)" terminals. The turret shall rotate a new lamp into position whenever the appropriate electrical signal is received by the stepping mechanism. The turret shall advance only one position at a time. Power to change lamps shall be stored in a spring by winding the lamp turret. Each time the stepping mechanism is actuated, it shall allow the turret to rotate under spring tension to bring the next lamp into the operating position. The spring tension shall not be so great as to damage the lamp filament as the turret rotates to the next position and stops. The total permissible rotation of the lampchanger turret between stops shall not exceed 360 degrees. The stepping mechanism shall also be capable of manual actuation. It shall be possible to manually rotate the turret backwards from the second through the sixth positions to any other position preceding the operating position. The lampchanger shall have a life expectancy of at least six years in a marine environment with a lamp burning continuously in the operating position, and with multiple rotations through all lamp positions. This six-year period will coincide with normal buoy hull relief operations and biennial inspections. The design should emphasize simplicity and reliability, consistent with the state of the art and the limitations on size stated herein.

3.2 Workmanship. In addition to any specific requirements listed herein, the workmanship of the lampchangers shall conform to Guideline 9 of MIL-HDBK-454.

3.3 First Article Testing. Lampchangers from contractors who have not previously provided items under this specification shall be subject to the first article test requirements described in section 4, below. The contractor shall be required to submit a First Article Test Plan before commencement of first article testing.

3.3.1 First Article Test Report. Upon completion of the first article tests, the contractor shall submit to the Contracting Officer a test report documenting, at a minimum, test equipment used with calibration certificate(s), the test procedure description, and completed test data sheets.

3.4 Environment. Unless otherwise specified herein, each lampchanger shall operate as specified in the following environments:

3.4.1 Ambient Temperature. From -25° F through +140° F.

3.4.2 Humidity. From 0% through 100% relative humidity.

3.4.3 Salt Air. Each lampchanger shall be constructed of material so as to be resistant to corrosion from continuous exposure to salt air.

3.4.4 Shock and Vibration. Each lampchanger shall be ruggedly constructed to withstand the shock and vibrations incident in transport to and service on lighted aids to navigation buoys and structures.

3.4.5 Ultraviolet Radiation. UV radiation exposure for an interval of six years that is typical of the Florida coast shall not cause any deterioration of the lampchanger's appearance or performance.

3.5 Mechanical Properties. The limiting dimensions of the lampchanger are shown in Drawing EOE 120050. The lampchanger must be capable of being directly mounted on top of a CG-181 (or CG-493) flasher conforming to specification G-ECV-181 (or G-SEC-493) using the four mounting holes provided. The exterior of the lampchanger shall be free from protrusions and sharp edges that may catch the clothing or cut servicing personnel.

3.5.1 Lamp Turret. The lampchanger shall rigidly support six 12-volt marine signal lamps (Drawing SK-1401) in a turret. The lamps are described in specification G-ECV-487. The lamps shall be spaced at 60 degree intervals about the turret, and the filament of the operating (uppermost) lamp shall be vertical. The notch in the prefocus collar of the lamps shall be oriented in the turret as specified in Drawing EOE 120050. No other orientation of the lamp shall be possible when it is locked in place. The lamp locking arrangement shall be such that lamps can be easily installed and removed by servicing personnel. The entire facet of turret position number 1 shall be colored red. The red marking shall be readily visible with a lamp in place.

3.5.2 Lamp Focal Position. The distance from the base of the lampchanger to the center of an ideal operating (uppermost) lamp, defined as the focal height, shall be $5\frac{3}{4} \pm \frac{1}{32}$ ". The error between the centerline of an ideal operating lamp, as defined in Drawing SK-1401, and the centerline of the lampchanger, with respect to the four mounting holes in the base, as defined in Drawing EOE 120050, shall not be greater than $\pm \frac{1}{32}$ ". The tolerances of an ideal lamp are zero.

3.5.3 Strength of Turret and Stepping Mechanism. The turret, lamp collar locks and stepping mechanism shall be designed and constructed so that an attempted rotation of the turret (with lamps) by hand in any direction shall not damage the lampchanger. No portion of the lampchanger shall be damaged by a 20 ± 1 inch-lb torque applied to the turret.

3.5.4 Terminals, Terminal Insulators, and Screws. There shall be three external 8-32 screw terminals located in the area specified in Drawing EOE 120050. All terminals shall be enclosed in slotted insulators sized to accept $1\frac{1}{32}$ " wide spring spade and hook lugs for a number 8 stud. The terminal insulators shall be molded of dielectric materials in accordance with the color code given in paragraph 3.5.5. Three 8-32 terminal screws shall be supplied with each lampchanger. With one of the above lugs in place, the top of the terminal screws shall not project above the top of the insulators. Terminal screws shall have at least $\frac{3}{8}$ inch of thread. The terminal screws and inserts shall be made of 300-series stainless steel or nickel-plated brass.

3.5.5 Terminal Arrangement and Markings. The three terminals shall be marked reading from left to right or top to bottom, as indicated below. The terminals shall be permanently and prominently marked "F," "L," and "(-)" and shall be identified by separate and distinctive colored insulators, as listed below, for the life of the lampchanger.

<u>Terminal</u>	<u>Meaning</u>	<u>Color</u>
“F”	Input terminal for positive voltage to lampchanger’s stepping mechanism supplied from flasher’s “F” terminal.	Blue
“L”	Input terminal for positive, time-coded voltage supplied from the flasher’s “L” terminal.	Red
“(–)”	Input terminal for negative lead from flasher’s “(–)” terminal.	White

3.5.6 Materials. Materials shall be selected to insure the highest reliability and longevity of the lampchanger. All electrical contacts between the frame and turret shall be gold plated in accordance with MIL-G-45204C(2), Type II, Grade C, and a minimum thickness of 0.00001 inch. The turret’s electrical contact with the single-point solder contact at the bottom of the lamp base shall be gold plated in accordance with MIL-G-45204C(2), Type II, Grade C, and a minimum thickness of 0.00001 inch. Materials used shall be galvanically compatible to minimize electrolytic action. Use of dissimilar metals in intimate contact shall be avoided, with the sole exception of stainless steel threaded inserts in combination with an aluminum frame and / or turret. Guidelines for developing a predictive model for galvanic corrosion performance are outlined in ASTM G82. All materials of the lampchanger shall be UV stabilized in order to meet the ultraviolet radiation protection requirements of section 3.4.5. The lampchanger shall not melt or show any signs of melting under normal operation during its entire lifetime.

3.5.6.1 Frame. The lampchanger shall have a rigid, solid metal L or U shaped frame with a metallic weight of at least 0.5 lb.

3.5.6.2 Turret. The turret shall be either metal, ceramic, or a heat-tolerant thermo-set plastic. All first article tests of this specification must be passed regardless of the material selected. The turret shaft and pivot shall be either stainless steel or nickel-plated brass. Nickel-plated brass turret contacts for the lamp collars are allowed.

3.6 Electrical Properties. Only the lamp in the operating (uppermost) position shall burn whenever power is applied between the “L” and “(–)” terminals. When a pulse of power is supplied between the “F” and “(–)” terminals, a stepping mechanism (3.6.2) shall allow the turret to rotate to bring the next lamp into the operating position.

3.6.1 Lamp Circuit. The lamp circuit shall consist of the “L” terminal, a lamp in the operating position, the “(–)” terminal, and electrical wiring and contacts as necessary. The resistance of the circuit, less the lamp resistance, shall not exceed 0.030 ohms. The entire circuit shall be electrically isolated from the lampchanger frame with a minimum resistance of 500 kΩ. The lamp circuit shall be capable of operating 12-volt lamps of up to 3.05 amps with applied positive voltages at the “L” terminal from 10 to 14 volts DC. The applied voltage may be either steady or time-coded pulses as short as 0.3 seconds in duration. This coded light pulse will normally be supplied by the “L” terminal of a CG-181 or CG-493 solid state flasher.

3.6.2 Stepping Mechanism. A stepping mechanism shall cause the turret to rotate by one position whenever the “F” terminal receives a positive 8 to 18 volt DC signal from 0.25 to 5.0 seconds in duration. This pulse will normally be supplied by the “F” circuit of a CG-181 or CG-493 solid state flasher. The resistance of the stepping circuit, between the “F” and “(-)” terminals shall be greater than 15 ohms. The entire circuit shall be electrically isolated from the lampchanger frame with a minimum resistance of 500 kΩ. The stepping mechanism shall cause a new lamp to reach the operating position within 0.4 seconds after the applied voltage is removed from the “F” terminal. The stepping mechanism shall be capable of easy manual activation from the exterior of the lampchanger for the purpose of testing lamps. The stepping mechanism manual activator shall be located in the space indicated on Drawing EOE 120050, Note 3, and designed to be activated by personnel wearing heavy winter gloves.

3.6.3 Sixth Lamp Position. There shall be a 56 ohm \pm 5%, 3 watt resistor in the turret in parallel with the sixth lamp position. The heat dissipated by this resistor shall not cause any melting, deformation, or degradation of lampchanger material, nor shall it cause any degradation of lampchanger performance or operation during the entire lifetime of the lampchanger.

3.7 Nameplate. A nameplate conforming to MIL-P-15024, TYPE G, or a two mil metallized silver coated polyester nameplate shall be permanently affixed to the side of the lampchanger. The information required on the nameplate is illustrated in the example below:

LAMPCHANGER	
TYPE	CG-6P
FEATURE	12V6P
MANUFACTURED BY:	(VENDOR'S NAME)
CONTRACT NUMBER:	
PROPERTY OF U.S. COAST GUARD	

3.8 Compatibility. The lampchanger, when lamped with any 12VDC marine signal lamp (up to 40 watts) shall be compatible with any solid state flasher that meets the requirements of specification G-ECV-181 or G-SEC-493.

4. QUALITY ASSURANCE PROVISIONS.

4.1 Quality System. The contractor's quality assurance program shall meet the minimum requirements of ANSI / ASQC C-1.

4.2 Contractor's Calibration System. The contractor shall maintain a calibration and maintenance system to control the accuracy of measurement and test equipment used in the fulfillment of this specification. The system shall include, as a minimum, prescribed calibration intervals and the source of calibration. A monitoring system to this requirement shall be readily available to the Coast Guard Inspector. Calibration shall be traceable to the National Institute of Standards and Technology.

4.3 Classification of Inspections. The inspection requirements specified herein are classified as follows:

- a. First Article Testing: 4.6 through 4.8;
- b. Production Inspection: 4.9.

4.4 Responsibility.

4.4.1 First Article Testing Responsibility. All tests and inspections of the first article units shall be the responsibility of the contractor and shall be conducted at a facility acceptable to the government. A First Article Test Plan shall be submitted to the Contracting Officer not later than 30 days prior to the commencement of first article testing. At a minimum this plan shall include:

- a. A chronological listing of the tests to be performed;
- b. Location of the test facility;
- c. A complete listing of all equipment to be used;
- d. Detailed test procedures for each test, including wiring diagrams of test setups and pass/fail criteria;
- e. All other pertinent information necessary to fully describe the test; and
- f. Test data sheets shall be provided with the test plan and shall be used to record observed performance data.

After approval of the First Article Test Plan by the government, the contractor shall notify the Contracting Officer three weeks prior to the start of first article testing. A government representative may witness the first article tests.

4.4.2 Production Inspection Responsibility. The contractor shall conform to all requirements of

the Federal Acquisition Regulations (FAR) Part 52.246-1; Contractor Inspection Requirements, and Part 52.246-2; Inspection of Supplies, Fixed Price. The contractor shall notify the Contracting Officer two weeks prior to the start of production testing. A government representative may witness any and all production inspections.

4.4.3 Certification. Certification of the gold plating (3.5.6) and turret material (3.5.6.2) shall be submitted prior to first article testing and each production inspection.

4.4.4 Inspections. The first article testing and production inspections required by paragraphs 4.6 through 4.9 are not intended to supplant any controls, examinations, inspections, or tests normally employed by the contractor to assure the reliability of this product. The contractor shall maintain an inspection system which ensures that each item offered to the government conforms to the contract requirements. The inspection system shall be documented and available for review by the Contracting Officer's Representative. The contractor shall maintain records of all tests and inspections. The records shall clearly indicate deficiencies revealed and the corrective action taken. The government reserves the right to perform any and all of the tests and inspections set forth in this specification to insure compliance for products offered.

4.4.5 Failure Responsibility. If a lampchanger fails to pass production acceptance inspection, the contractor shall take corrective action on the materials or process, or both as warranted, on all items or portions thereof which were similarly manufactured and which are subject to the same cause for failure. Depending on the type and number of failures, the inspection may be discontinued at the option of the government until all corrective action has been taken. After all corrective action has been taken, the inspection shall be continued or repeated, depending on the reason for which the inspection was interrupted, at the option of the government. Acceptance shall be withheld until reinspection has shown that the corrective action was successful and the equipment or portion thereof satisfactorily passes all inspections.

4.4.6 Resubmitted Lots. If an inspection lot is rejected, the manufacturer may rework the lot or screen out defective items and resubmit it for reinspection. Resubmitted lots shall be kept separate from new lots.

4.5 First Article Test Sequence. Four lampchangers shall be submitted for first article testing. All four first article units shall be subjected to the Routine Tests (4.6). At the conclusion of the Routine Tests, two lampchangers shall be subjected to the Laboratory Tests (4.7) and the other two lampchangers shall be subjected to the Accelerated Life Test (4.8).

4.5.1 First Article Acceptance. The acceptance/rejection criteria for the first article tests are provided in paragraphs 4.6.4, 4.7.5, 4.7.6.2, 4.7.6.4, 4.7.6.7, 4.7.6.9, and 4.8.4, below. The first article lampchangers must successfully meet all of these acceptance criteria for the contractor to receive authorization to begin production. Upon failure to meet any of the acceptance criteria, the contractor shall take corrective action on the materials or processes or both, as warranted, prior to recommencing the first article tests. The extent of re-testing required as a result of a failure is at the sole discretion of the Contracting Officer. Failure to successfully complete the first article testing in the time set forth in the contract shall be grounds for termination of the contract.

4.6 Routine Tests. Each first article lampchanger submitted for approval and each production lampchanger in an inspection lot submitted for acceptance shall be subjected to the following routine tests.

4.6.1 Initial Visual Inspection. Each lampchanger shall be visually inspected to see that it meets the requirements of paragraphs 3.1, 3.2, 3.5, 3.5.1, 3.5.2, 3.5.3, 3.5.4, 3.5.5, 3.5.6, 3.5.6.1, 3.5.6.2, 3.6.2, 3.6.3, and 3.7.

4.6.2 Electrical Tests. Verify conformance to requirements of paragraphs 3.6 through 3.6.3.

4.6.2.1 Isolation of the Lampchanger Frame. Place 18 volts DC between each terminal and the frame for at least 5 seconds, note the current flow and calculate the resistance. The resistance shall not be less than 500K ohms between any terminal and the frame. The positive connection for this test is made to the terminals and the negative connection is made to the mounting holes in the frame.

4.6.2.2 Operation Check. With the turret loaded with 12 volt, 3.05 ampere lamps, wind the turret to the first lamp position. Apply steady and 0.3 second time coded pulses of 10 and 14 VDC between the "L" and "(-)" terminals to verify that the lampchanger complies with 3.6.1. Advance the turret and repeat for each turret position. Rewind the turret and apply 0.25 and 5.0 second pulses of 8.0 and 18.0 VDC between the "F" and "(-)" terminals to verify that the lampchanger complies with 3.6.2. The turret shall advance one lamp position, starting from the first position, each time a pulse is applied.

4.6.2.3 6th Position Resistor Test.

4.6.2.3.1 Resistor Value Check. Advance the lampchanger to the sixth position. With no lamp in place, apply 12VDC \pm 1% to the "L" and "(-)" terminals. Measure the current, and verify that the resistance of the resistor in parallel with the sixth lamp position is 56 ohm \pm 5%.

4.6.2.3.2 Resistor Heat Dissipation Check. Perform this test at 140° F: With the lampchanger in the 6th position loaded with a 3.05 ampere lamp, apply 12.2-volts DC between the "L" and "(-)" terminals. Ensure the lamp is on and operating properly. Operate for twenty hours. At the end of the twenty hours, the lampchanger shall show no signs of material degradation, and manual actuation and rewind of the turret shall still function normally.

4.6.3 Lamp Position. Check the alignment and positioning of the operating lamp as specified in 3.5.2. Measure the focal height and horizontal positioning (radially about the centerline) of the operating lamp in each position. The focus fixture (GFE) may be used in place of a lamp for this test. Also, a pass/fail test fixture may be used for this test.

4.6.4 Acceptance/Rejection Criteria. Failure of any first article lampchanger to meet all of the requirements of the Routine Tests (4.6) shall constitute a failure of the first article tests and shall be reason for withholding approval of production. Failure of any production lampchanger to comply with all aspects of the Routine Tests (4.6) shall be reason to reject that lampchanger.

4.7 Laboratory Tests. Upon successful completion of the routine tests, two (2) first article units shall be subjected to a series of laboratory tests. For the purpose of these tests, DC power shall be provided by a regulated, electronic DC power supply. Voltage pulses shall be provided via a relay.

4.7.1 Strength of Turret and Stepping Mechanism. With the turret in the number one position apply a 20 ± 1 inch-lb torque to the turret in an attempt to rotate it in the direction of the spring force. The contractor may perform this torque test using a focus fixture (GFE) modified to hold the moment arm. Perform this test with the modified focus fixture in the number 1 and number 6 turret positions. However, in the number 1 position, rotation shall be attempted in both clockwise and counter-clockwise directions. To insure that the requirements of paragraph 3.5.3 are met, test the lampchanger for proper operation by repeating the operational checks specified in paragraph 4.6.2.2. Re-check the horizontal positioning of each lamp (4.6.3) to insure that no permanent deformation has resulted.

4.7.2 Electrical Resistance. Measure the resistance of the lamp circuit for all six turret positions and of the stepping mechanism circuit at $70^{\circ} \text{ F} \pm 5^{\circ} \text{ F}$, and insure compliance with the requirements of paragraphs 3.6.1 and 3.6.2. Calculate the lamp circuit resistance by installing a 12 volt, 3.05 amp lamp in the operating position, applying 12.0 VDC between the “L” and “(-)” terminals and measuring the total current drawn by the circuit and the voltage both at the above terminals and across the lamp. The voltage difference divided by the total current is the lamp circuit resistance. For the sixth lamp position, correct the measured resistance by accounting for the resistor placed in parallel with the lamp circuit.

4.7.3 Electrical Performance. Perform the following electrical tests at $-25^{\circ} \text{ F} \pm 5^{\circ} \text{ F}$ and $140^{\circ} \text{ F} (-0, +5)^{\circ} \text{ F}$.

a. Lamp Circuit. Insure that both 12VDC, 0.25 and 3.05 ampere lamps operate at full luminous output when a 3.0 second pulse of 10.0 and 14.0 VDC is applied between the “L” and “(-)” terminals. Check for all six turret positions.

b. Stepping Mechanism. Insure that the stepping mechanism progresses through all six positions when a 0.3 second pulse of 8.0 and 18.0 VDC is applied between the “F” and “(-)” terminals. This test shall be done when the turret is loaded with 0.25 ampere and 3.05 ampere lamps.

4.7.4 Relamping Time. With the turret loaded with 3.05 amp lamps apply 12.0VDC to the “L” and “(-)” terminals and a 3.0 second pulse of 12.0VDC to the “F” and “(-)” terminals. Measure the time required for a new lamp to reach each operating position after the F-pulse is removed (3.6.2).

4.7.5 Acceptance/Rejection Criteria. Failure of more than two horizontal positioning errors occurring in 4.6.4 and 4.7.1 or any failure in 4.7.2 through 4.7.4 shall constitute a failure of the first article tests and shall be reason for withholding approval of production.

4.7.6 Environmental Tests.

4.7.6.1 Vibration. The two units selected for laboratory testing shall be tested in accordance with MIL-STD-202F, Method 204D, using Test Condition D with the duration reduced to three cycles (each cycle 20 minutes long) and the maximum amplitude to 5-G's in each of three mutually perpendicular directions. Samples shall be attached to a rigid fixture capable of transmitting all the vibration conditions. During the vibration cycling the turret shall be in the number 5 position with an external 0.25 ampere lamp load and with 14.0 volts DC applied to the lamp circuit between the "L" and "(-)" terminals. During the cycle in which the lampchanger is mounted up-right, note and measure any electrical discontinuities in the lamp circuit.

4.7.6.2 Acceptance/Rejection Criteria. Discontinuities in the lamp circuit exceeding 10 milliseconds or rotation of the turret during vibration shall constitute a failure of the first article tests and shall be reason for withholding approval of production.

4.7.6.3 Shock. Both lampchangers selected for laboratory testing shall be tested in accordance with MIL-STD-202F, Method 213B. Samples shall be rigidly mounted and subjected to ten blows of 11 milliseconds, 20-G's peak acceleration, sawtooth pulse in each of six directions detailed in Figure 1. The turret shall be filled with 12-volt, 0.25 ampere lamps. When the lampchanger is mounted in direction 2, as detailed in Figure 1, 12.0 VDC shall be applied between the "L" and "(-)" terminals. With the turret in the 2nd position, during the last two drops in which the lampchanger is mounted in direction 2, discontinuities in the lamp circuit shall be noted and measured.

4.7.6.4 Acceptance/Rejection Criteria. Discontinuities in the lamp circuit exceeding 10 milliseconds or rotation of the turret when mounted in more than one of the six possible directions shall constitute a failure of the first article tests and shall be reason for withholding approval of production.

4.7.6.5 Humidity. Both units selected for laboratory testing shall be tested in accordance with MIL-STD-202F, Method 103B, using Test Condition B. During exposure the lampchangers shall not be energized nor the lamps installed.

4.7.6.6 Humidity Test Evaluation. Immediately following the Humidity Test (4.7.6.5), the lampchangers shall be thoroughly scrubbed and washed with fresh (tap) water to remove any evidence of residue and air blasted clean and dry. The following tests shall be conducted after a four-hour air drying of the lampchangers:

- a. Isolation of the Lampchanger Frame, as outlined in paragraph 4.6.2.1, above; and
- b. Operation Check, as outlined in paragraph 4.6.2.2, above.

4.7.6.7 Acceptance/Rejection Criteria. Failure of more than one test point in the humidity test evaluation (4.7.6.6) out of a total of 24 test points shall constitute a failure of the first article tests, and shall be reason for withholding approval of production. One lampchanger at one input voltage and one pulse width, for all six turret positions, evaluated against one requirement is defined as one test point.

4.7.6.8 Salt Spray (Corrosion). Both lampchangers selected for laboratory testing shall be tested in accordance with MIL-STD-202F, Method 101D, in a 5% salt solution (by weight) with a 48 hour exposure time (test Condition B). After exposure, the interior and exterior shall be thoroughly inspected for evidence of extreme corrosion. Measure the resistance of the resistor in parallel with the sixth lamp position in accordance with the procedures outlined in paragraph 4.6.2.3.1.

4.7.6.9 Acceptance/Rejection Criteria. Extreme corrosion, failure of the nameplate to remain attached to the frame, evidence of terminal marking degradation, or failure of the resistor in the sixth lamp position to be $56\ \text{ohms} \pm 5\%$ shall constitute a failure of the first article tests, and shall be reason for withholding approval of production.

4.8 Accelerated Life Test. The remaining two (2) first article lampchangers which were not subjected to laboratory tests shall be subjected to an accelerated life test. The test shall consist of: (1) a lampchanger burn-in test, and (2) multiple operation test (150 complete cycles).

4.8.1 Test One (Burn-in). With 12VDC power applied to the lamp circuit and a 3.05 ampere lamp loaded in each turret position, each lampchanger shall be operated continuously for six days (one day in each turret position) at an ambient temperature of $140 \pm 5^\circ\text{F}$.

4.8.2 Test Two (Multiple Operation). At room temperature and with no power applied between the “L” and “(-)” terminals, the turret, still fully loaded with 3.05 ampere lamps, shall be wound to the number 1 position and then 0.3 second on / 0.7 second off pulses of 18.0 VDC shall be applied between the “F” and “(-)” terminals. When the turret has reached the number 6 position, the 18 volt pulses shall be turned off. The turret shall be rewound to the number 1 position and the process repeated for a total of 150 complete cycles.

4.8.3 Evaluation. After completion of the tests outlined in paragraphs 4.8.1 and 4.8.2 above, the two lampchangers shall undergo the following tests:

- a. Lamp Position inspection, as outlined in paragraph 4.6.3, above;
- b. Operational Check, as outlined in paragraph 4.6.2.2, above.

4.8.4 Acceptance/Rejection Criteria. More than one failure during the Lamp Position inspection (4.6.3) or any failure during the Operation Check (4.6.2.2) shall constitute a failure of the first article tests and shall be reason for withholding approval of production.

4.9 Production Inspection. The contractor shall maintain an inspection system to ensure each item offered to the U. S. Coast Guard for acceptance or approval conforms to the contract requirements. The inspection system shall be documented and available for review by the Contracting Officer’s designated representative. All items shall meet all of the requirements of this specification. The inspection set forth in this specification shall become a part of the contractor’s overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility for ensuring

that all deliverables submitted to the U. S. Coast Guard for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable process to ascertain conformance to requirements. However, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the U. S. Coast Guard to accept defective material.

4.9.1 Inspection Lot. A lot shall be all of the lampchangers from an identifiable production period from one manufacturer and one plant and submitted for acceptance at one time. An inspection sample lot shall be subjected to the Routine Tests, outlined in section 4.6, above.

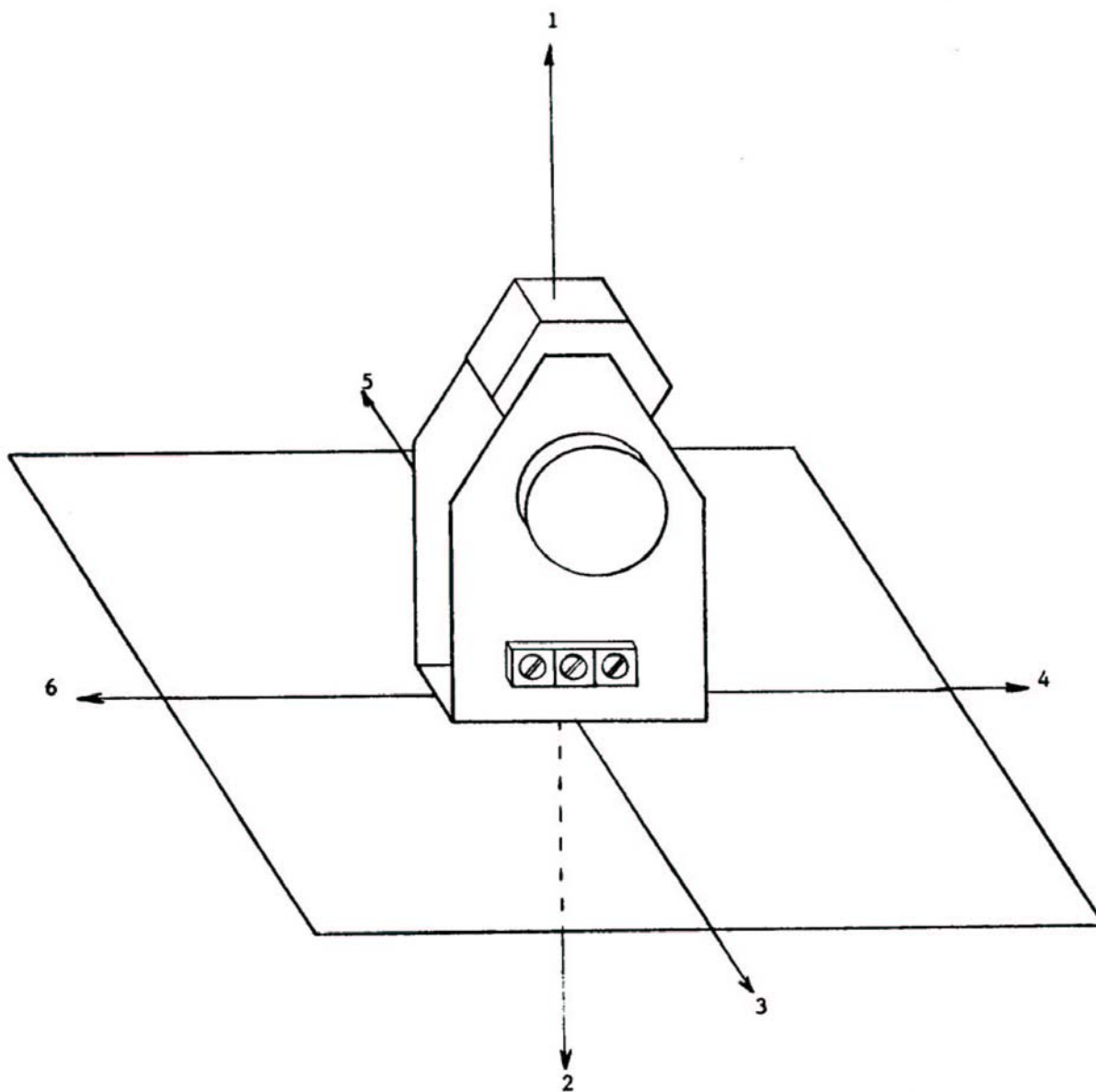
4.9.2 Sampling. The inspection sample size shall be determined using the following table:

<u>Inspection Lot Size</u>			<u>Sample Lot Size</u>
16	to	50	3
51	to	150	5
151	to	500	8
501	to	3200	13
3201	to	35000	20

4.9.3 Acceptance/Rejection Criteria. Failure of more than one unit in the sample lot, as outlined in paragraph 4.6.4, above, shall be cause for rejection of the entire lot.

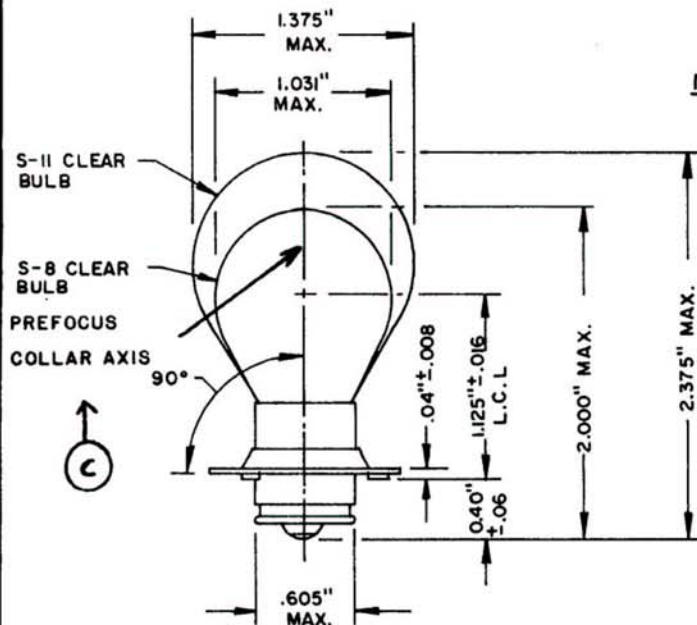
4.9.4 Failure Responsibility. If a lot fails to pass production inspection, the contractor shall take corrective action on the materials or process, or both as warranted, on all items or portions thereof which were similarly manufactured and which are subject to the same cause for failure. Depending on the type and number of failures, the inspection may be discontinued at the discretion of the government inspector until all corrective action has been taken. After all corrective action has been taken, the inspection shall be continued or repeated, depending on the reason for which the inspection was interrupted. Acceptance shall be withheld until reinspection has shown that the corrective action was successful and the equipment or portion thereof satisfactorily passes all inspections.

4.9.5 Resubmitted Lots. If an inspection lot is rejected, the manufacturer may rework the lot or screen out defectives and resubmit it for inspection. Resubmitted lots shall be kept separate from new lots.



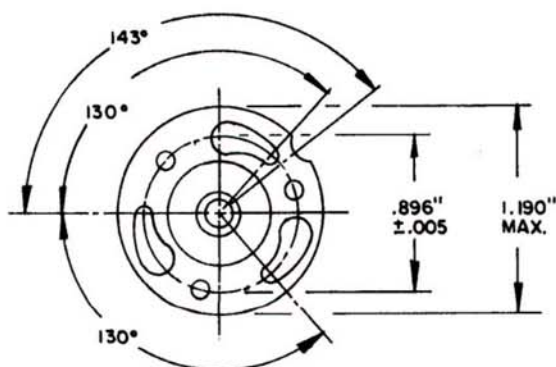
DIRECTION OF SHOCK DROP
FIGURE 1

ENGINEERING DATA						
AMPERES	.25	.55	.77	1.15	2.03	3.05
TOLERANCE	± 7%	± 7%	± 7%	± 7%	± 7%	± 7%
FILAMENT HEIGHT	.60CM	.55CM	.70CM	.70CM	.80CM	.93CM
TOLERANCE	±20%	±20%	±20%	±20%	±20%	±20%
FILAMENT WIDTH	.025CM	.020CM	.030CM	.040CM	.060CM	.08 CM
TOLERANCE	±25%	±25%	±25%	±25%	±25%	±25%
LUMEN OUTPUT	30	70	120	180	380	600
TOLERANCE	-15%	-15%	-15%	-15%	-15%	-15%
BULB	S-8	S-8	S-8	S-8	S-8	S-II



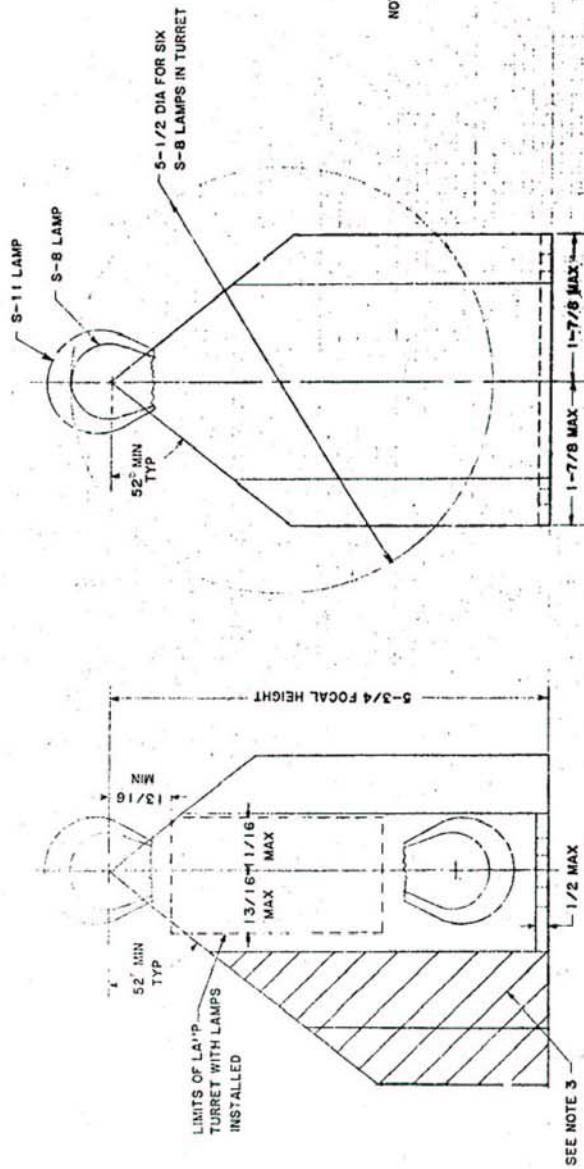
NOTES

1. ALL FILAMENTS ARE C-8.
2. THE RATED LIFE OF ALL LAMPS IS 500 HOURS.
3. BASE MATERIAL: BRASS, NICKEL PLATED.
4. THE PREFOCUS COLLAR AXIS MUST BE COAXIAL WITH THE LAMP FILAMENT AXIS: TOL. ± .016
5. THE LAMP BASE MUST NOT VARY MORE THAN 4° FROM THE PREFOCUS COLLAR AXIS.



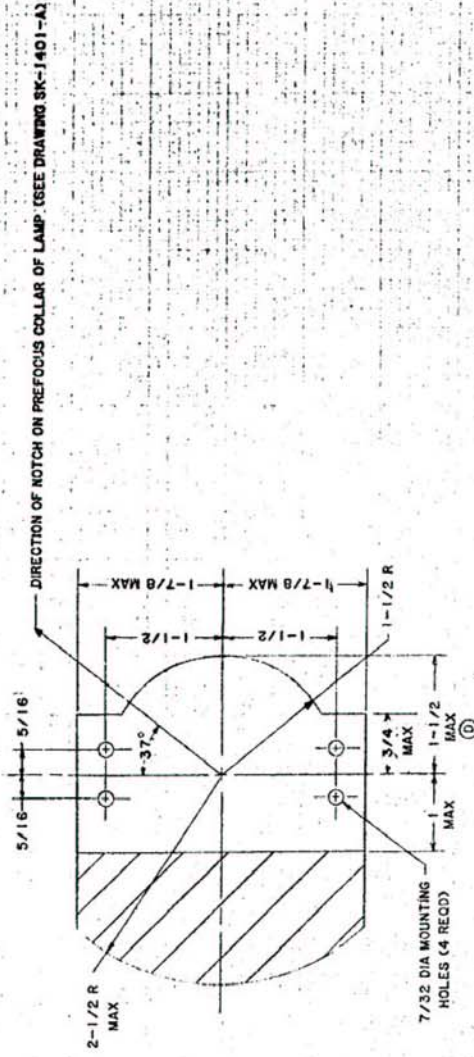
CANDELABRA PREFOCUS
SINGLE CONTACT BASE

③	10/25/65	J.M.	LABEL ADDED	
②	5/17/77	J.M.	ADDED TOLERANCE	4W B
①	6/23/76	J.M.	REDRAWN WITH DIM. CHANGE	U TU
REV.	DATE	APPR.	DESCRIPTION	BY
DE:	U.S. COAST GUARD HEADQUARTERS			
DR: W.T.W.	OCEAN ENGINEERING			
TR:	MARINE SIGNAL LAMP (12 VOLT)			
CH:				
REVIEWED BY:				
CHIEF A & O SEC.				
REVIEWED BY:				
CHIEF SIG. BR.	APPROVED: [Signature]			DATE: 7/15/76
SCALE: 1/1	SHEET 1 OF 1			DR. NR. SK 1401-A



NOTES:

1. THIS DRAWING SHOWS CRITICAL DIMENSIONS, IN INCHES, AND MAXIMUM PHYSICAL SIZE OF A SIX-PLACE LAMPCHANGER, EXCLUDING LAMPS.
2. THE LAMPCHANGER NEED NOT PHYSICALLY RESEMBLE THESE DRAWINGS, HOWEVER, IT MUST FIT WITHIN THE MAXIMUM DIMENSIONS GIVEN.
3. TERMINALS, STEPPER MECHANISM AND MANUAL ACTUATOR MUST BE LOCATED IN THIS SPACE.
4. THE TOLERANCE ON DIMENSIONS NOT LABELED MAX OR MIN IS $\pm 1/32$ INCH.



DESIGNED BY	DATE	APPROVED BY	DESCRIPTION
U.S. COAST GUARD	HEADQUARTERS		
ENGINEERING			
12-VOLT,			
SIX-PLACE			
LAMPCHANGER			
120050			
REV D			

SPECIFICATION FOR 12VDC, SIX-PLACE LAMPCHANGERS (TYPE CG-6P)

SPECIFICATION NUMBER: G-SEC-195H

JANUARY 2001

Prepared by:

SIGNATURE ON FILE

K. Agi
Project Engineer

Reviewed by:

SIGNATURE ON FILE

J. T. Grasson
Signal & Power Team Leader

Approved by:

SIGNATURE ON FILE

H. R. Cleveland
Chief, Ocean Engineering Division

26 January 2001

Date